PARADYNE®

TNE1520-P and TNE1520-S
T1 Network Extenders Installation Instructions

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Contents

Software and Firmware License Agreement 1
Product Documentation 3
Warranty, Sales, Service, and Training Information 3
Package Contents 3
Connecting to Power 4
Configure the T1 Ports 5
Connect the T1 Lines 9
Connect the Ethernet Line 10
LED Indicators 12
EMI Notices 14
ACTA Customer Information 14
Supplier's Declaration of Conformity 16
Notice to Users of the Canadian Telephone Network 16
Important Safety Instructions 17

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10. This Agreement shall be governed by the laws of the State of Florida, without regard to its provisions concerning conflicts of laws.

Product Documentation

This document describes units manufactured after 13 January 2005. See the prior version of this document for information about units manufactured on or before that date.

Complete documentation for Paradyne products is available at **www.paradyne.com**. Select *Support* → *Technical Manuals*.

To order a paper copy of a Paradyne document, or to speak with a sales representative, please call 1-727-530-2000.

Warranty, Sales, Service, and Training Information

Contact your local sales representative, service representative, or distributor directly for any help needed. For additional information concerning warranty, sales, service, repair, installation, documentation, training, distributor locations, or Paradyne worldwide office locations, use one of the following methods:

- **Internet:** Visit the Paradyne World Wide Web site at **www.paradyne.com**. (Be sure to register your warranty at **www.paradyne.com/warranty**.)
- **Telephone:** Call our automated system to receive current information by fax or to speak with a company representative.
  - Within the U.S.A., call 1-800-795-8004
  - Outside the U.S.A., call 1-727-530-2340

Package Contents

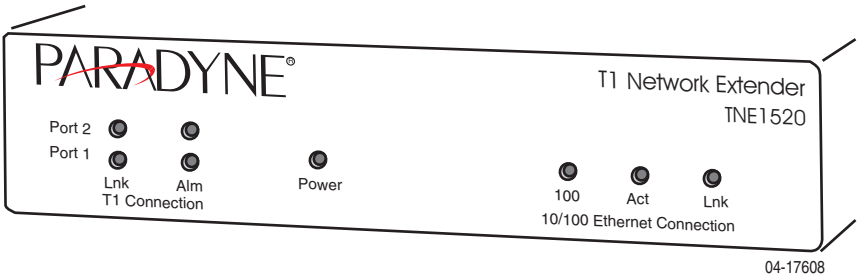
Unpack and Inspect the Equipment. The following components should be included:

- 1 TNE1520
- 1 Power supply

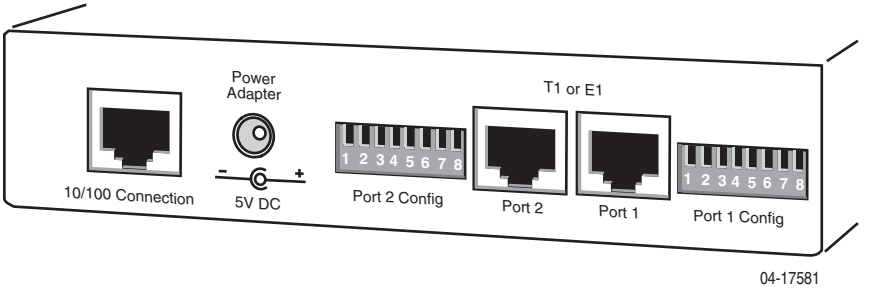
If there is any visible damage, do not attempt to connect the device. Contact your sales or service provider.

Connecting to Power

Plug the power supply into the Power Adapter port on the back of the TNE1520 and connect it to your power source.



Verify that the Power LED on the front of the TNE1520 is illuminated.



Upon start up, the Ethernet link will remain disabled (as indicated by no illumination of the Ethernet 100, Act and Lnk LEDs) until at least one of the two T1 connections has been established.

Configure the T1 Ports

Configuration Switches for both T1 Port 1 and T1 Port 2 are numbered from left to right, 1–8.

Table 1. TNE1520-P Provider Configuration Switches

Switch	Port 1	Port 2
1	Speed	Speed
2		
3	Frame Type	NOT USED: Port 2 frame type is determined by the Port 1 frame type
4	Line Code	NOT USED: Port 2 line code is determined by the Port 1 line code
5	Line Attenuation	NOT USED: Port 2 line attenuation is determined by the Port 1 line attenuation
6		
7	Timing	NOT USED: Port 2 timing is determined by the Port 1 timing
8	NOT USED	NOT USED

Table 2. TNE1520-S Subscriber Configuration Switches

Switch	Port 1	Port 2
1	NOT USED: The TNE1520-S determines speed via communication with its partner T1 provider unit	NOT USED: The TNE1520-S determines speed via communication with its partner T1 provider unit
2		
3	Frame Type	NOT USED: Port 2 frame type is determined by the Port 1 frame type configuration
4	Line Code	NOT USED: Port 2 line code is determined by the Port 1 line code configuration
5	Line Attenuation	NOT USED: Port 2 line attenuation is determined by the Port 1 line attenuation configuration
6		
7	NOT USED	NOT USED
8	NOT USED	NOT USED

Speed – Ports 1 and 2, Switches 1 and 2: TNE1520-P Only

The T1 lines each have 24 channels continually running at 64 kbps for a collective bandwidth of 1,536 kbps. The timeslot configuration determines how many of the channels for each port will actually receive data. Ports configured to operate as fractional T1 lines require contiguous timeslots as indicated in the table below.

Port 1 Configuration Switches 1 and 2 on the TNE1520-P work together to provide four timeslot/bandwidth options for the Port 1 T1 link. Port 2 Configuration Switches 1 and 2 on the TNE1520-P provide the timeslot/bandwidth options for the Port 2 T1 link. The TNE1520-S determines timeslot and bandwidth configurations for the two T1 links via communication with its partner T1 provider unit.

Table 3. T1 Speed Settings

Switch 1	Switch 2	Timeslots	Bandwidth (kbps)
down	down	1–24	1,536
up	down	1–18	1,152
down	up	1–12	768
up	up	1–6	384

Frame Type – Port 1 Only, Switch 3

Frame type is the T1 data encapsulation method. A frame consists of 193 bits (8-bit samples of each of the 24 T1 data channels plus a synchronization bit) transmitted at a rate of 8,000 frames per second (1,536 kbps) across the T1 line.

- Extended Super Frame – Extended Super Frame (ESF) format, used in Wide Area Networks (WANs), assembles data into 24-frame transmission clusters and integrates the following:
  - — Facilities Data Link: Facilities Data Link (FDL) provides in-service monitoring and diagnostics.
  - — Cyclic Redundancy Check: Cyclic Redundancy Check (CRC) scrutinizes data integrity and detects line errors.
- Super Frame – Super Frame (SF) format assembles data into 12-frame transmission clusters. SF does not utilize FDL or CRC.

Port 1 Configuration Switch 3 controls the frame type of both T1 links (Port 1 and Port 2); frame type for the two links cannot be configured independently.

Table 4. Frame Type Settings

Switch 3	Frame Type
down	Extended Super Frame
up	Super Frame

Line Code – Port 1 Only, Switch 4

Line code is the T1 mode of transmission. The two line code options outlined below fall within the International Telecommunication Union - Telecommunication Standardization Sector (ITU-T) G.703 Standards for Transmission Facilities.

- Bipolar with 8 Zero Substitution – Bipolar with 8 Zero Substitution (B8ZS) is used to accommodate the minimum ones density requirement in the North American public network. B8ZS line encoding helps prevent loss of synchronization between the TNE1520 and remote T1 equipment by using bipolar violations to guarantee the presence of pulses in the T1 line.
- Alternate Mark Inversion – Alternate Mark Inversion (AMI) alternates positive and negative pulses.

Port 1 Configuration Switch 4 on the TNE1520-P and the TNE1520-S controls the line code of both T1 links (Port 1 and Port 2); line code for the two links cannot be configured independently.

Table 5. Line Code Settings

Switch 4	Line Code
down	Bipolar with 8 Zero Substitution
up	Alternate Mark Inversion

Line Attenuation – Port 1 Only, Switches 5 and 6

Shorter distances between the TNE1520 and remote modems require increasing T1 transmit line attenuation in order to prevent the T1 signal from becoming too strong for repeaters, switches and other T1 transmission equipment that may be encountered along the line. Increased line attenuation translates to decreased T1 transmit amplitude.

- 0 dB – Receivers on most newer T1 transmission equipment can automatically adjust for incoming amplitude, allowing them to run at zero attenuation regardless of distance.
- –7.5 dB, –15 dB, –22.5 dB – Some older T1 transmission equipment cannot automatically adjust for incoming amplitude and line attenuation must be set accordingly.

Port 1 Configuration Switches 5 and 6 on the TNE1520 control the line attenuation of both T1 links (Port 1 and Port 2); line attenuation for the two links cannot be configured independently.

Table 6. Line Attenuation Settings

Switch 5	Switch 6	Attenuation
down	down	0 dB
up	down	–7.5 dB
down	up	–15 dB
up	up	–22.5 dB

Timing – Port 1 Only, Switch 7: TNE1520-P Only

Timing refers to the clock source for T1 transmission links.

- Local – Local clock source refers to timing derived from an oscillator onboard the TNE1520-P.
- Loop – Loop clock source refers to timing derived from an intermediate device.

Port 1 Configuration Switch #7 controls the timing of both T1 links (Port 1 and Port 2) on the TNE1520-P; timing for the two links cannot be configured independently. The TNE1520-S determines T1 timing via communication with its partner T1 provider unit.

Table 7. Timing Settings

Switch 7	Clock Source
down	Local
up	Loop

Connect the T1 Lines

The primary feature of the TNE1520 is loop bonding capability, although both the provider and subscriber units are able to function with a single T1 connection.

Loop Bonded Connection

Using two T1 lines for one network connection (loop bonding) will net twice the speed and data passing capability as a single T1 connection. A second T1 line also provides backup should one of the lines become disabled. A TNE1520 can only establish loop bonded connections with other Paradyne loop bonding-capable T1 equipment. See *Product to Product SDSL Loop Bonding Capability* (document number COMP-A2-GK42).

▶ Procedure

To establish a loop bonding connection:

1. Plug the T1 cables into the T1 RJ45 ports (Port 1 and Port 2) on the back of the TNE1520; the order of connection is not important.
2. Verify both connections: the Port 1 and Port 2 Lnk LEDs on the front of the TNE1520 will pulse green to indicate the connections are established and operational.

Single T1 Connection

A single line connection can be established between a TNE1520-P and any of Paradyne's T1 subscriber units, regardless of loop bonding capability. Likewise, a single line connection can also be established between an TNE1520-S and any of Paradyne's T1 provider units, regardless of loop bonding capability.

▶ Procedure

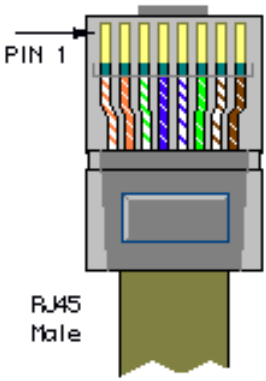
To establish a single-line connection:

1. Plug the T1 cable into one of the two T1 RJ45 ports on the back of the TNE1520; either port (Port 1 or Port 2) may be used.
2. Verify the connection: the T1 link LED on the front of the TNE1520 (Port 1 Lnk or Port 2 Lnk depending upon which port was connected) will pulse green to indicate the connection is established and operational.

If you are using a shielded T1 cable for your network connection, it must be grounded through pins 3, 6, 7 and 8.

Table 8. T1 RJ45 Pinouts

Pin	Function
Pin 1	Rx Ring
Pin 2	Rx Tip
Pin 3	Not used
Pin 4	Tx Ring
Pin 5	Tx Tip
Pin 6	Not used
Pin 7	Not used
Pin 8	Not used



Connect the Ethernet Line

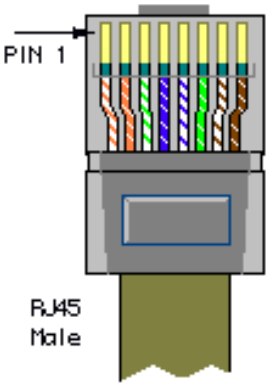
The 10/100 Ethernet Port auto-negotiates speed and duplex mode in accordance with the remote equipment to which it is connected; Ethernet speed and duplex mode configurations cannot be hard set on the TNE1520. For the best connection results, the remote device (PC, hub, switch, etc.) should be set to auto-negotiate speed and duplex mode as well. If the remote device cannot be configured to auto-negotiate, speed may be hard set at either 10 Mbps or 100 Mbps but duplex mode must be hard set to Half Duplex; a 10/100 Ethernet connection will not operate properly if the remote device is hard set to Full Duplex.

Plug the Ethernet cable into the 10/100 Ethernet Port on the back of the TNE1520. Verify the connection: solid green illumination of the 10/100 Ethernet Connection Lnk (Link) LED on the front of the TNE1520 indicates a connection has been established. If the Ethernet Lnk LED is illuminated but not the Ethernet 100 LED then a 10 Mbps connection has been established. If the Ethernet Lnk AND 100 LEDs are both illuminated, then a 100 Mbps connection has been established.

For most applications, the TNE1520 connects to a PC using a straight-through Ethernet cable and to a hub or a switch using a crossover Ethernet cable. For any other connection combinations you must verify the pinout of the Ethernet device to which you are connecting the TNE1520 in order to determine which type of cable is required.

Table 9. Ethernet Pinouts

Pin	Function
Pin 1	Rx+
Pin 2	Rx–
Pin 3	Tx+
Pin 4	not used
Pin 5	not used
Pin 6	Tx–
Pin 7	not used
Pin 8	not used



LED Indicators

This document describes units manufactured after 13 January 2005. See the prior version of this document for information about units manufactured on or before that date.

Whenever both T1 connections lose link or experience a T1 Alarm, the Ethernet link is automatically be disabled (as indicated by no illumination of the Ethernet 100, Act and Lnk LEDs). Upon reestablishment of at least one of the T1 connections, the Ethernet link is reinstated and the Ethernet LEDs reflect current Ethernet Status.

Table 10. LEDs (1 of 2)

LED	STATE	INDICATION	ADDITIONAL INFORMATION
T1 Connections Lnk (Port 1 and Port 2)	Flashing* Green	T1 connection is established and active	Traffic is flowing.
	Solid Green	Problematic T1 connection	A connection exists but there is indication of a problem with the T1 line.
	No Illumination	Red Alarm: The incoming connection to the unit has been lost; no data is being received.	If the outgoing connection from the unit has also been lost then the unit's partner TNE1520 will be in Red Alarm as well.
T1 Connections Alm (Port 1 and Port 2)	No Illumination	T1 is operational	An established T1 link has no alarm indications and is operational unless the T1 Lnk LED remains unlit as well, in which case the TNE1520 is in Red Alarm.
	Solid Amber	Yellow Alarm: The outgoing connection from the unit has been lost; no data is being transmitted.	The unit's partner TNE1520 has lost its incoming connection and is in Red Alarm.
	Pulsing* Amber	Blue Alarm: An indirect connection has been lost; the unit may no longer be receiving data from its partner TNE1520.	The unit's partner TNE1520 has lost a connection with an intermediate device and is in Red or Yellow Alarm.
Power	Solid Green	TNE1520 is operational	If the Power LED is not illuminated, it is unlikely that the TNE1520 is receiving power and therefore none of the LEDs will be illuminated.

Table 10. LEDs (2 of 2)

LED	STATE	INDICATION	ADDITIONAL INFORMATION
10/100 Ethernet Connection 100	Solid Green	100 Mbps Ethernet connection is established	If the Ethernet 100 LED is illuminated, the Ethernet Lnk LED will also be illuminated.
	No Illumination	No 100 Mbps Ethernet connection	If the Ethernet 100 LED remains unlit but the Ethernet Lnk LED is illuminated then a connection has been established at 10 Mbps rather than 100 Mbps.
10/100 Ethernet Connection Act	Pulsing* Amber	Standard operation	Traffic is flowing without any problems.
	Solid Amber	Heavy traffic	
	No Illumination	N	Either there is no Ethernet link or a link exists but there is no activity.
10/100 Ethernet Connection Lnk	Solid Green	Ethernet connection is established	If the Ethernet Lnk LED is illuminated but not the Ethernet 100 LED then a 10 Mbps connection has been established. If the Ethernet 100 LED is also illuminated, then a 100 Mbps connection has been established.
	No Illumination	No Ethernet connection	The Ethernet 100 and Act LEDs will remain unlit by default.

* A pulsing LED blinks steadily at a rate of once per second. A flashing LED blinks at a more rapid, less constant rate.

EMI Notices

United States – EMI Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The authority to operate this equipment is conditioned by the requirements that no modifications will be made to the equipment unless the changes or modifications are expressly approved by Paradyne Corporation.

If the equipment includes a ferrite choke or chokes, they must be installed as described in the installation instructions.

Canada – EMI Notice

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

ACTA Customer Information

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the Administrative Council for Terminal Attachments (ACTA). On the bottom of the network extender is a label that contains, among other information, a product identifier in the format US:AAAEQ##TXXXX. If requested, this number must be provided to the telephone company.

The T1 network connections should be made using a Universal Service Order Code (USOC) type RJ48C jack. The Service Order Code 6.0F should be specified to the telephone company when ordering the T1 line. In addition, the proper Facility Interface Code must be specified to the Telephone Company. The network extender can be configured to support any of the following framing format and line signaling techniques. The network extender's configuration must correspond to the T1 line's parameters.

Facility Interface Codes	Code Description
04DU9-BN	1.544 Mbps superframe format (SF) without line power
04DU9-DN	1.544 Mbps SF and B8ZS without line power
04DU9-1KN	1.544 Mbps ANSI ESF without line power
04DU9-1SN	1.544 Mbps ANSI ESF and B8ZS without line power

A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ACTA. See installation instructions for details.

If the network extender causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with this equipment, please contact your local sales representative, service representative, or distributor directly for any help needed. For additional information concerning warranty, sales, service, repair, installation, documentation, training, distributor locations, or Paradyne worldwide office locations, use one of the following methods:

- Internet: Visit the Paradyne World Wide Web site at www.paradyne.com. (Be sure to register your warranty at www.paradyne.com/warranty.)
- Telephone: Call our automated system to receive current information by fax or to speak with a company representative.
  - Within the U.S.A., call 1-800-795-8004
  - Outside the U.S.A., call 1-727-530-2340

If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

The customer may make no repairs to the equipment.

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

Supplier's Declaration of Conformity

Place of Issue: Paradyne Corporation
8545 126th Avenue North
Largo, FL 33773-1502
USA

Date of Issue: 3/31/2005

Paradyne Corporation, located at the above address, hereby certifies that the following models: TNE1500-X and TNE1520-X (X = P or S) bearing labeling identification number US:AW2DDNANTNE1500 complies with: the Federal Communications Commission's ("FCC") Rules and Regulations 47 CFR Part 68, and the Administrative Council on Terminal Attachments ("ACTA")-adopted technical criteria TIA-968-A, "Telecommunications - Telephone Terminal Equipment -Technical Requirements for Connection of Terminal Equipment To the Telephone Network, October 2002," as amended by ANSI/TIA-968-A-3 2004, "Telecommunications - Telephone Terminal Equipment -Technical Requirements for Connection of Terminal Equipment to the Telephone Network - Addendum 3."

Patrick Murphy
Senior Vice President, Chief Financial Officer

Notice to Users of the Canadian Telephone Network

NOTICE: This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation IC before the registration number signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

NOTICE: The Ringer Equivalence Number (REN) for this terminal equipment is labeled on the equipment. The REN assigned to each terminal equipment provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed five.

If your equipment is in need of repair, contact your local sales representative, service representative, or distributor directly.

⚠ Important Safety Instructions

1. Read and follow all warning notices and instructions marked on the product or included in the manual.
2. Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the product and to protect it from overheating, these slots and openings must not be blocked or covered.
3. Do not allow anything to rest on the power cord and do not locate the product where persons will walk on the power cord.
4. Do not attempt to service this product yourself, as opening or removing covers may expose you to hazardous voltage or to other risks. Refer all servicing to qualified service personnel.
5. General purpose cables are used with this product for connection to the network. Special cables, which may be required by the regulatory inspection authority for the installation site, are the responsibility of the customer. Use a UL Listed, CSA certified, minimum No. 26 AWG line cord for connection to the Digital Subscriber Line (DSL) network.
6. When installed, the product must comply with the applicable Safety Standards and regulatory requirements of the country in which it is installed. If necessary, consult with the appropriate regulatory agencies and inspection authorities to ensure compliance.
7. A rare phenomenon can create a voltage potential between the earth grounds of two or more buildings. If products installed in separate buildings are **interconnected**, the voltage potential may cause a hazardous condition. Consult a qualified electrical consultant to determine whether or not this phenomenon exists and, if necessary, implement corrective action prior to interconnecting the products.
8. Input power to this product must be provided by one of the following: (1) a UL Listed/CSA certified power source with a Class 2 or Limited Power Source (LPS) output for use in North America, or (2) a certified power source, with a Safety Extra Low Voltage (SELV) output having a maximum of 240 VA available, for use in the country of installation.
9. In addition, since the equipment is to be used with telecommunications circuits, take the following precautions:
   - — Never install telephone wiring during a lightning storm.
   - — Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
   - — Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
   - — Use caution when installing or modifying telephone lines.
   - — Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning.
   - — Do not use the telephone to report a gas leak in the vicinity of the leak.

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